



Design Review Process

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Engineering and Design Review Process – Available Steps

- Write Requirements Document
- Develop Conceptual Design
- Present Conceptual Design to Project and / or Collaboration and /or External Committee and / or Consultants (Depends on Complexity and Risk Associated with Item)
- Test Prototype Components as needed to develop design.
- Perform Engineering analysis to develop the final design.
 - Generate engineering notes.
 - Identify and correct any safety or performance hazards.
- Prepare fabrication drawings



Engineering and Design Review Process

- Perform peer review of the engineering note(s).
 - Best performed by one person checking one engineering note thoroughly.
- Initiate independent review of the design
 - Usually performed by a committee and involves presentations as well as the signed off fabrication drawings and checked engineering notes. Identify and correct any safety hazards.
- Fabricate and Assemble And Test Components
- Identify and correct any safety or performance hazards.
- Initiate Operational Readiness Review in preparation to receive and Operational Readiness Clearance (ORC).
- Perform Accelerator Readiness Review (ARR) per FESHM 2010 for approval to operate.



Examples

- Detector Structure
- Module Structure
 - End caps
 - Manifold
 - Glue Joints
 - Fiber Installation Tooling
- Scintillator Blending
- Scintillator Filling
- Building
- Detector Assembly
 - Glue Machine
 - Block Pivot Table
- Readout Electronics
- Detector Electronics Cooling
- Recycler Ring Injection Kicker System Magnet
- Recycler Ring 53 MHz RF System.



Detector Structure Example

- Conceptual Design Developed in late 2004
- Detector Structures Identified as “RISKS”
 - Glue Shear Stress is Risk # 1, See Docdb 500
 - PVC Creep is Risk # 3, See Docdb 813
- PM appointed External Committee Reviewed the conceptual design in January 2006
- Engineering Analysis Effort continued to examine minute details for many loading conditions thru 2006/7
- Internal Project Team Met (chaired by PM) to absorb analysis effort results and direct next efforts. Eighteen meetings were between October 15, 2006 and May 8, 2007. Minutes taken. See Docdb 496.
 - Included four Engineers (including Analysis specialist) and four Physicists.
 - **Unanimously concluded that the structure can be built**
 - Members chosen for independent thinking
 - Not always in unanimous agreement on all aspects.
 - Lead to decision creating Factory #1. (See chapter 15 of TDR)
 - Internal Meetings will Continue
- Engineering Notes Documenting the sum of all the analysis load cases remain to be completed.



Detector Cooling System Example

- Water Based Conceptual Design Developed in 2006. Competing Designs also developed.
- PM charged Internal Committee Chaired by John Oliver Reviewed the conceptual designs in November 2006 and recommended which to adopt. See docdb 1220.
- Following the design choice, an engineer external to the project reviewed the design documentation for the chosen design and generated findings. External reviewer charged at the request of the PM and Mechanical Project Engineer.
- Calculations and the Engineering Note addressing the findings remain to be completed by the project.



Fiber Insertion Machine Example

- Design of Fiber Insertion Machine developed in 2005.
- Presented to the Collaboration at several collaboration meetings in 2005 and 2006. Design Documentation posted in Docdb 1228.
- Device built, tested and shown to be satisfactory in late CY 2006.
 - External Electrical person inspected the device and any observed deficiencies corrected.
 - Formal safety inspection in 12/06.
 - Machine shown to satisfactorily meet its functional requirements



Summary

- Many Design Review Process Tools are Available.
- Not all tools used on every component.
- Tools chosen so that the components with the highest risk receive the most thorough review.
- The minimum for all components is the generation of a written, reviewed engineering note.
- There is no upper limit on the level of reviews.
 - For example, spokesman has identified a world expert who may be able to examine our detector structure